

REMARKS

The Office Action mailed August 28, 2006, has been received and reviewed. Claims 1, 3-22, 24-27, 31-40, 42, and 43 are currently pending in the application. Claims 1, 3-22, 24-27, 31-40, 42, and 43 stand rejected. Applicants have amended claims 1, 7, 11, 12, 14, 15, 18, 19-21, 24, 25, 26, 31-36, 38, 40, 42, and 43, and respectfully request reconsideration of the application as amended herein.

Information Disclosure Statement

Please note that an Information Disclosure Statement was filed herein on December 6, 1999, and that no copy of the PTO-1449 was returned with the outstanding Office Action. It is respectfully requested that an initialed copy of the PTO-1449 evidencing consideration of the cited references be returned to the undersigned attorney.

35 U.S.C. § 112 Claim Rejections

Claims 9, 10, 12, and 13 stand rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, it is alleged that although the Specification has sufficient written description for removing a conformal layer faster than a first dielectric layer, the Specification lacks written description for removing a first dielectric layer faster than a conformal layer. Office Action mailed August 28, 2006, at page 3. Applicants respectfully traverse this rejection, as hereinafter set forth.

Applicants respectfully submit that the Specification provides adequate written description for removing a first dielectric layer faster than a conformal layer. For example, the Specification, at page 17, lines 17 through 18, discloses that “insulator island 22 [(a first dielectric layer)] has a greater material removal rate than . . . isolation film 36 [(a conformal layer)].” As such, applicants respectfully submit that sufficient written description exists in the Specification for removing a first dielectric layer faster than a conformal layer. Consequently, applicants

respectfully request the withdrawal of the rejections of claims 9, 10, 12, and 13 under 35 U.S.C. § 112, first paragraph, and reconsideration of same.

Claim 21 stands rejected under 35 U.S.C. § 112, first paragraph, as allegedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, it is alleged that the Specification provides that when the edges are rounded, as recited in claim 18, the trench liner of claim 21 is formed at the same time and, therefore, there is no support for an additional process step as recited in claim 21. Office Action mailed August 28, 2006, at pages 3 and 4. Applicants respectfully traverse this rejection as hereinafter set forth.

Applicants respectfully submit that support in the Specification exists for the creation of a liner upon the sidewall of an isolation trench absent the rounding of the edges. For example, the Specification, at page 12, lines 14 through 17, describes a method for the creation of a liner upon a sidewall of an isolation trench without engaging in the thermal oxidation of the sidewall. As such, applicants respectfully submit that sufficient written description exists in the Specification for two process steps that allow the separate formation of a liner and rounded edges. Consequently, applicants respectfully request the withdrawal of the rejection of claim 21 under 35 U.S.C. § 112, first paragraph, and reconsideration of same.

Claims 9, 10, 12, and 13 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. Specifically, it is alleged that “the limitations of these claims are contradicting what has been disclosed, therefore, the claims are indefinite.” Office Action mailed August 28, 2006, at page 4. Applicants respectfully traverse this rejection, as hereinafter set forth.

As noted *supra*, applicants respectfully submit that the Specification does not contradict, but in fact supports, the elements of claims 9, 10, 12, and 13. Further, applicants submit that the claims apprise one of ordinary skill in the art of their scope and that, as such, the claims are

definite within the meaning of 35 U.S.C. § 112, second paragraph. *See, e.g.*, M.P.E.P. § 2173. For the foregoing reasons, applicants respectfully request the withdrawal of the rejections of claims 9, 10, 12, and 13 under 35 U.S.C. § 112, second paragraph, and reconsideration of same.

35 U.S.C. §103(a)

Obviousness Rejection Based on U.S. Patent No. 6,097,072 to Omid-Zohoor in view of U.S. Patent No. 5,387,540 to Poon et al.

Claims 1, 3-22, 24-26, and 31-34 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,097,072 to Omid-Zohoor (hereinafter “Omid-Zohoor”) in view of U.S. Patent 5,387,540 to Poon (hereinafter “Poon”). Applicants respectfully submit that claims 1, 3-22, 24-26, and 31-34 are nonobvious over Omid-Zohoor in combination with Poon.

Omid-Zohoor teaches a method of forming trenches with suppressed parasitic edge transistors. Trenches 360 are formed in a substrate 120 having a pad oxide layer 340 and silicon nitride layer 344 thereon. (Omid-Zohoor, FIG. 3I). Spacers 356 flank the trenches 360. A thick oxide layer 364 is deposited to cover the wafer and fill the trenches 360. A reverse mask 368 is placed over defined trench regions. The mask is followed by an etch which creates oxide ridges (Omid-Zohoor, col. 4, lines 47-55, FIG. 3L). The upper surface of the oxide layer 372 is polished to expose the silicon nitride layer 344. (*Id.*, FIG. 3M).

Poon is cited for teaching the formation of a thermal liner within a trench surface. Office Action mailed August 28, 2006, at page 6.

Applicants respectfully submit the proposed combination of references fail to teach or suggest all of the limitations of the presently claimed invention.

Independent claim 1, as amended, recites, in part, “filling each isolation trench with a conformal layer. . . so as to define an upper surface contour of the conformal layer” and “substantially simultaneously subjecting the entire upper surface contour of the conformal layer to a planarizing process.” Support for the amendment may be found throughout the specification, including for example, at FIGs. 6A and 6B and related text and page 14, line 14–page 15, line 10.

By contrast, Omid-Zohoor teaches the deposition of a reverse-resist mask 368 over trench

regions 356 (Omid-Zohoor, FIG. 3K, col. 4, lines 51-52) and subsequent wet or dry etch to partially remove oxide layer 364 and leave a reduced oxide layer 372 with ridges 373 (*Id.*, FIG. 3L, col. 4, lines 52-54). Applicants respectfully submit that Omid-Zohoor does not teach or suggest all of the limitations of claim 1 as the presence of the reverse-resist mask protects a portion of the conformal layer and thus prevents “substantially simultaneously subjecting the entire upper surface contour of the conformal layer to a planarizing process” as recited in claim 1.

Applicants further submit that the planarizing of the reduced oxide layer 372 with oxide ridges 373 until silicon nitride layer 344 is exposed (Omid-Zohoor, FIGs. 3L and 3M, col. 4, lines 54-57, 59-61) also does not teach or suggest this limitation as the planarization is conducted on a layer that had part of the conformal layer removed along with the reverse-resist mask. Therefore, Omid-Zohoor does not teach or suggest planarizing the entire upper surface contour created by the deposition of the conformal layer.

Since Poon is relied on for teaching forming a thermal liner within a trench surface, Poon fails to cure the deficiencies of Omid-Zohoor. As the proposed combination of references fails to teach or suggest all of the limitations of the presently claimed invention, Applicants respectfully submit that Omid-Zohoor in view of Poon does not render claim 1 obvious. Accordingly, claim 1 is allowable.

Claims 3-6 are each allowable, *inter alia*, as depending from allowable claim 1.

Each of independent claims 7, 14, 18, 24, 25, 26, and 31 has been amended to be substantially similar to claim 1 in regard to the limitations of “filling each isolation trench with a conformal layer. . . so as to define an upper surface contour of the conformal layer” and “substantially simultaneously subjecting the entire upper surface contour of the conformal layer to a planarizing process.” As such, applicants respectfully submit that each of independent claims 7, 14, 18, 24, 25, 26, and 31 is allowable at least for substantially the same reasons as independent claim 1.

Applicants respectfully submit that dependent claims 8-13, 15-17, 19-22, and 32-34 are at least allowable as depending from an allowable independent claim

Claim 9 is further allowable as the cited references fail to teach or suggest removing the first dielectric layer using an etch recipe that etches the first dielectric layer faster than the

conformal layer and the spacers by a ratio in a range from about 1:1 to about 2:1.

Claim 12 is further allowable because the cited references do not teach or suggest that the upper surface for each of the isolation trenches is formed in an etch process using an etch recipe that etches the first dielectric layer faster than the conformal layer and the spacers by a ratio in a range from about 1:1 to about 2:1.

Claims 10 and 13 are further allowable because the cited references do not teach or suggest that the ratio is in a range from about 1.3:1 to about 1.7:1.

For the foregoing reasons, applicants respectfully request the withdrawal of the rejections of claims 1, 3-22, 24-26, and 31-34 under 35 U.S.C. § 103(a) and reconsideration of same.

Obviousness Rejection Based on Omid-Zohoor and Poon in view of U.S. Patent No. 6,069,083 to Miyashita et al.

Dependent claim 27 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Omid-Zohoor and Poon as applied to claim 26 above, and further in view of U.S. Patent No. 6,069,083 to Miyashita et al. (hereinafter “Miyashita”). Applicants respectfully traverse this rejection, as hereinafter set forth.

The discussion of Omid-Zohoor and Poon is incorporated herein. Miyashita is cited for allegedly teaching “planarizing the conformal layer in a single-step by an etch using an etch recipe that etches the conformal layer faster than the first dielectric layer by a ratio from about 1 to about 3.” Office Action mailed August 28, 2006, at page 24.

“To establish a *prima facie* case of obviousness . . . there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings.” *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). The Examiner states that it would have been obvious to combine the cited references “to planarize the conformal third layer of Omid-Zohoor ‘072 utilizing an etch ratio as taught by Miyashita to form the upper surface of the microelectronic structure.” Office Action mailed August 28, 2006, at page 24. However, applicants respectfully submit that the Examiner has not made out a *prima facie* case of obviousness because the Examiner’s statement does not provide a suggestion or motivation to combine the teachings of Miyashita with those of

Omid-Zohoor and Poon. Instead, the Examiner's statement is conclusory because it does not provide reasons that support combination of the cited references. As such, applicants respectfully request that the rejection of claim 27 under 35 U.S.C. § 103(a) be withdrawn.

In addition, claim 27 is allowable, *inter alia*, as depending from allowable claim 26.

Obviousness Rejection Based on Omid-Zohoor in view of Wolf Silicon Processing for the VLSI Era, Vol. 2, pp. 54 and 55

Claims 35-40, 42, and 43 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Omid-Zohoor in view of Wolf. Applicants respectfully traverse the rejection.

The discussion of Omid-Zohoor is incorporated herein. Wolf is cited for teaching that the top edge of an isolation trench may be rounded and that the semiconductor substrate may be doped. Office Action mailed August 28, 2006, at page 24-25. Applicants respectfully submit the proposed combination of references fails to teach or suggest all of the limitations of the presently claimed invention.

Independent claim 35, as amended, recites, in part, "having a second layer filling the isolation trench . . . so as to define an upper surface contour of the second layer" and "substantially simultaneously subjecting the entire upper surface contour of the second layer to a planarizing process." Support for the amendment may be found throughout the specification, including, for example, FIGs. 6A and 6B and related text and page 14, line 14— page 15, line 10.

As discussed *supra*, Omid-Zohoor teaches the deposition of a reverse-resist mask 368 over trench regions 356 (Omid-Zohoor, FIG. 3K, col. 4, lines 51-52) and subsequent wet or dry etch to partially remove oxide layer 364 and leave a reduced oxide layer 372 with ridges 373 (*Id.*, FIG. 3L, col. 4, lines 52-54). Applicants respectfully submit that Omid-Zohoor does not teach or suggest all of the limitations of claim 35, as amended, as the presence of the reverse-resist mask protects a portion of the conformal layer and thus prevents "substantially simultaneously subjecting the entire upper surface contour of the conformal layer to a planarizing process" as recited in claim 35.

Applicants further submit that the planarizing of the reduced oxide layer 372 with oxide ridges 373 until silicon nitride layer 344 is exposed (Omid-Zohoor, FIGs. 3L and 3M, col. 4,

lines 54-57, 59-61) also does not teach “substantially simultaneously subjecting the entire upper surface contour of the second layer to a planarizing process” as recited by claim 35 as the planarization is conducted on a layer that had part of the conformal layer removed along with the reverse-resist mask. Therefore, the planarization is not conducted on a layer having the upper surface contour created by the deposition of the conformal layer. As such, Omid-Zohoor does not teach or suggest planarizing the entire upper surface contour created by the deposition of the conformal layer.

Since Wolf is relied upon for teaching that a top edge of an isolation trench may be rounded and that the semiconductor substrate may be doped, Wolf fails to cure the deficiencies of Omid-Zohoor. As the proposed combination of references fails to teach or suggest all of the limitations of the presently claimed invention, Applicants respectfully submit Omid-Zohoor in view of Wolf does not render claim 35 of the presently claimed invention obvious. Accordingly, claim 35 is allowable.

Claims 36 and 37 are each allowable, *inter alia*, as depending from allowable claim 35.

Independent claims 38, 42, and 43 have been amended to be substantially similar to claim 35 in regard to the limitations of “having a second layer filling the isolation trench . . . so as to define an upper surface contour of the second layer” and “substantially simultaneously subjecting the entire upper surface contour of the second layer to a planarizing process.” As such, applicants respectfully submit that independent claims 38, 42, and 43 are allowable at least for substantially the same reasons as independent claim 35.

Applicants respectfully submit that dependent claims 39 and 40 are at least allowable as depending from allowable independent claim 38.

In view of the foregoing, applicants respectfully request that the rejection of claims 35-40, 42, and 43 under 35 U.S.C. § 103 be withdrawn.

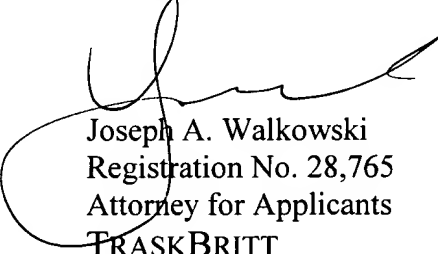
ENTRY OF AMENDMENTS

The amendments to claims 1, 7, 11, 12, 14, 15, 18, 19-21, 24, 25, 26, 31-36, 38, 40, 42, and 43 should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add new matter to the application.

CONCLUSION

Claims 1, 3-22, 24-27, 31-40, 42, and 43 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, he is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,



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